WHAT IS CLAIMED IS:

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1. A hidden line processing method for avoiding projection of lines hidden by a plurality of polygons in projecting a three-dimensional model consisting of the polygons onto a two-dimensional plane, comprising the steps of:

obtaining the maximum value PZ_{max} of the Z-axis and Transition direction component of each vertex in a viewpoint coordinate system for each of the plurality of polygons belonging to parts constituting the three-dimensional model;

sorting the plurality of polygons in a descending order based on the obtained maximum values PZ_{max} ;

obtaining a value LZ_{\min} that is the smaller of the Z-axis direction components in the viewpoint coordinate system of two (2) end points of an arbitrary line obtained from the plurality of polygons; and

comparing the maximum value PZ_{max} of the Z-axis of the Z-axis of the direction component of the plurality of polygons with the contract value LZ_{min} that is the smaller of the above obtained Z-axis direction components of the arbitrary line, in the sorted order, wherein

at the time when $LZ_{min} \ge PZ_{max}$, determination of whether or not the lines are hidden lines is avoided for polygons subsequent to the plurality of polygons sorted.

- 2. The hidden line processing method according to claim 1, wherein, for the plurality of polygons belonging to the arbitrary part, each of their normal vectors has a component in the opposite direction against the direction 5 of the line of sight from the viewpoint of the viewpoint coordinate system.
- 3. A hidden line processing method for avoiding the strategy of projection of lines hidden by a plurality of polygons in 10 projecting as three-dimensional model consisting of the sear was a arma realization polygons on to a two-dimensional plane, comprising the steps as uping the of;

for a priority polygon group including a predetermined number of polygons obtained in the order of large projection area made when each of a plurality of polygons constituting a three-dimensional model is projected onto a two-dimensional plane, and for a plurality of polygon groups constituting a part to which a line undergoing determination to be a hidden line or not, in the order which was -20 , of the priority polygon group and the plural ${f i}$ ty of polygon ${f e}$ constants. groups constituting the part,

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obtaining the maximum value PZ_{max} of the Z-axis direction component of each vertex in a viewpoint coordinate system for each of the plurality of polygons;

sorting the plurality of polygons in a descending order based on the obtained maximum values PZmax;

obtaining a value LZ_{min} that is the smaller of the Z-axis

direction components in the viewpoint coordinate system, of two (2) end points of an arbitrary line obtained from the plurality of polygons; and

comparing the maximum value PZ_{max} of the Z-axis direction component of the plurality of polygons with the value LZ_{min} that is the smaller of the above obtained Z-axis direction components of the arbitrary line, in the sorted order, wherein

at the time when $LZ_{\min} \ge PZ_{\max}$, determination of whether 10° or not the lines are hidden lines is avoided for polygons 10° or subsequent to the plurality of polygons sorted.

- 4. The hidden line processing method according to claim
 1, wherein
- the arbitrary line is a side common to polygons adjacent to each other, of which the angle formed by respective normal vectors is not equal or close to 0° .
- and broken of 5. The hidden line processing method according to claim and according to claim and according to the steps of the steps of

defining an inclusive circle including vertices of the polygon when each of the plurality of polygons is projected onto a two-dimensional plane;

determining whether a portion of an arbitrary line
25 is present in the inclusive circle corresponding to the
polygon for the polygons for which determination of whether
or not the line is an internal line is not avoided; and

erasing hidden line portions on the two-dimensional plane when the portion of the arbitrary line is present in the inclusive circle.

5 6. The hidden line processing method according to claim 3, wherein

the arbitrary line is a side common to polygons adjacent to each other, of which the angle formed by respective normal vectors is not equal or close to 0° .

same as the 7. The hidden line processing method according to claim admission

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3, further comprising the steps of; Francisco moderning the steps of;

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defining an inclusive circle including vertices of the polygon when each of the plurality of polygons is projected onto a two-dimensional plane;

determining whether a portion of an arbitrary line is present in the inclusive circle corresponding to the polygon for the polygons for which determination of whether or not the line is an internal line is not avoided; and where 20 reasing hidden line portions on the two-dimensional plane when the portion of the arbitrary line is present in the inclusive circle.

8. A method for identifying as an internal line a ridge
25 line or an contour line of a three-dimensional model,
appearing when only the interior of the three-dimensional
model is displayed in projecting the three-dimensional

model consisting of a plurality of polygons onto a two-dimensional plane, comprising the steps of:

determining the value in the Z-axis direction of a normal vector belonging to each of two polygons having a ridge line or an contour line of the three-dimensional model as a common side; and

determining the common side as an internal line if the value in the Z-axis direction of any of the normal value of vectors of the two polygons is determined zero (0) or less

based on the determination of the direction of the normal was a dec

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- The method for identifying an internal line according 9. to claim 8, further comprising the steps of:
- determining the relation of the positions of the two polygons in the Z-axis direction in the case where the directions of the values in the Z-axis direction of the normal vectors belonging respectively to the two polygons differs from each other based on the determination of the contracts > 20 of irection cofethernormal evectors; > and > > 20 of the correspondence where >

determining the common side as an internal line when the normal vector of a polygon present on the viewpoint side is negative.

25 The method for identifying an internal line according to claim 8, further comprising the step of:

determining the common side as an internal line when

the senses of the values in the Z-axis direction of the normal vectors respectively belonging to each of the two polygons are different from each other based on the determination of the directions of the normal vectors, when a portion of a side of one of the two polygons is hidden by the other polygon and when the direction of the normal vector of the other polygon is negative.

- 11. The hidden line processing method according to claim
- the steps of; and it is a second of the steps of; and it is a second of the steps of the step of the steps of the steps of the step of the s

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determining the value in the Z-axis direction of the control of normal vector belonging to each of the two polygons having to each a ridge line or an contour line of the three-dimensional model as a common side;

determining the common side as an internal line when the value in the Z-axis direction of any of the normal vectors of the two polygons is zero (0) or less based on the determination of the directions of the normal vectors; rolle, \$1 alleger on the **and** common and the first of the content of the architecture of the architecture

- east record 20 to the excluding the line determined as an internal diner from a destroyer the target of the arbitrary lines.
 - The hidden line processing method according to claim 3, further comprising the steps of;
 - 25determining the value in the Z-axis direction of the normal vector belonging to each of the two polygons having a ridge line or an contour line of the three-dimensional .

model as a common side;

determining the common side as an internal line when the value in the Z-axis direction of any of the normal vectors of the two polygons is zero (0) or less based on the determination of the directions of the normal vectors; and

excluding the line determined as an internal line from the target of the arbitrary lines. The target of the arbitrary lines.

- 10 13. The hidden line processing method according to claim
- Fig. () is $m_{
 m color} \sim 11$, wherein in Wilsewicks of the electric $m_{
 m color} \sim 11$, where $m_{
 m color} \sim 10$, which

belonging to the arbitrary part have components in the opposite direction against the direction of the line of sight from the viewpoint in the viewpoint coordinate system.

- 14. The hidden line processing method according to claim
- 12, wherein

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belonging to the arbitrary part have components in the opposite direction against the direction of the line of sight from the viewpoint in the viewpoint coordinate system.

15. The method for determining an internal line according to claim 11, further comprising the step of:

determining the common side as an internal line when the senses of the values in the Z-axis direction of the normal vectors respectively belonging to each of the two polygons are different from each other based on the 5 determination of the directions of the normal vectors, when a vertex of a polygon of the two polygons is in the other polygon, when the value in the Z-axis direction of a vertex of a polygon is larger than the value in the 2-axis direction of a vertex of the other polygon and when the 10 direction of the normal vector of the polygon is negative.

an transfer of the for determining an internal line according هو المعالمة الله المعالمة المع to claim 12, further comprising the step of:

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determining the common side as an internal line when the senses of the values in the Z-axis direction of the normal vectors respectively belonging to each of the two polygons are different from each other based on the determination of the directions of the normal vectors, when a vertex of a polygon of the two polygons is in the the the state of the state where m > 20 cother polygon, when the value in the Z -axis direction s of m > 2a vertex of a polygon is larger than the value in the Z-axis direction of a vertex of the other polygon and when the direction of the normal vector of the polygon is negative.

> 2517. The method for determining an internal line according to claim 11, further comprising the step of:

> > determining the common side as an internal line when

the senses of the values in the Z-axis direction of the normal vectors respectively belonging to each of the two polygons are different from each other based on the determination of the directions of the normal vectors, when a portion of a side of one of the two polygons is hidden by the other polygon and when the direction of the normal vector of the other polygon is negative.

18. The method for determining an internal line according to the step of: 10 to claim 12, further comprising the step of: 10 to claim 12, further comprising the step of: 10 to claim 12, further comprising the step of: 10 to claim 12, further comprising the step of: 10 to claim 12, further comprising the step of: 10 to claim 12, further comprising the step of the s

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determining the common side as an internal line when the common side as an internal line when a common side as an internal line when th

three-dimensional model consisting of a plurality of polygons onto a two-dimensional plane in a state that the model is stuffed, comprising the steps of:

determining the value in the Z-axis direction of the
25 normal vector belonging to each of two polygons having
a ridge line or an contour line of a three-dimensional
model as a common side; and

determining the common side as an internal line when the value in the Z-axis direction of any of the normal vectors of the two polygons is zero (0) or less based on the determination of the directions of the normal vectors, wherein

the sectional view of the three-dimensional model is displayed such that the sectional view is displayed in a state that it is stuffed, by excluding the line determined as an internal line from the target to be displayed in 10 a line image projected on the two-dimensional plane.

further wherein

an internal line to be excluded from the target of

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display in a line image projected onto the two-dimensional plane is the common side determined as an internal line when the senses of the values in the Z-axis direction of the normal vectors respectively belonging to each of the two polygons are different from each other based on the determination of the directions of the normal vectors, when a vertex of a polygon of the two polygons is in the other polygon, when the value in the Z-axis direction of a vertex of a polygon is larger than the value in the Z-axis direction of the two polygon and when the direction of the normal vector of the polygon is negative.

21. The method for projecting according to claim 19,

wherein

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an internal line to be excluded from the target of display in a line image projected onto the two-dimensional plane is the common side determined as an internal line.

5 when the senses of the values in the Z-axis direction of the normal vectors respectively belonging to each of the two polygons are different from each other based on the determination of the directions of the normal vectors; when a portion of a side of one of the two polygons is hidden by the other polygon and when the directions of the normal vector of the other polygon is negative:

22. An information processing apparatus for creating a two-dimensional image by projecting a three-dimensional model consisting of a plurality of polygons onto a two-dimensional plane, comprising:

the first of the control of the cont

a memory storing a program for processing of avoiding projecting of lines hidden by the polygons, and program data;

reading out of the program stored in the memory: and v

a display apparatus for outputting and displaying a two-dimensional image created by the program executed and controlled by the program executing and controlling means, wherein

the program executing and controlling means, according to the program and based on the program data

stored in the memory, obtains the maximum value PZ_{max} of the Z-axis direction component of each vertex in a viewpoint coordinate system for each of the plurality of polygons belonging to parts constituting the three-dimensional model;

sorts the plurality of polygons in a descending order based on the obtained maximum values PZ_{max} ;

direction components in the viewpoint coordinate system for the constraint of two (2) and points: of an arbitrary line obtained from the correction of two (2) and points: of an arbitrary line obtained from the correction of the plurality: of polygons;

compares the maximum value PZ_{max} of the Z-axis direction was a component of the plurality of polygons with the value LZ_{min} that is the smaller of the above obtained Z-axis direction

15 components of the arbitrary line, in the sorted order; and

at the time when $LZ_{\min} \ge PZ_{\max}$, executes a process for avoiding determination of whether or not the lines are hidden lines for polygons subsequent to the plurality of the second s

23. The information processing apparatus according to claim 22, wherein, for the plurality of polygons belonging to the arbitrary part, each of their normal vectors has a component in the opposite direction against the direction of the line of sight from the viewpoint of the viewpoint coordinate system.

24. An information processing apparatus for creating a two-dimensional image by projecting a three-dimensional model consisting of a plurality of polygons onto a two-dimensional plane, comprising:

a memory storing a program for processing of avoiding projecting of lines hidden by the polygons, and program data;

program executing and controlling unit executing

and the program stored in the memory: and the security and controlled by the program executing and controlling means,

wherein

the program executing and controlling means, according to the program and based on the program data stored in the memory,

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for a priority polygon group including a predetermined number of polygons obtained in the order of large projection.

20 area made when each of a plurality of polygons constituting a three-dimensional model is projected onto a two-dimensional plane, and for a plurality of polygon groups constituting a part to which a line undergoing determination to be a hidden line or not; and

in the order of the priority polygon group and the plurality of polygon groups constituting the part,

obtains the maximum value PZ_{max} of the Z-axis direction

component of each vertex in a viewpoint coordinate system for each of the polygons;

sorts the plurality of polygons in a descending order based on the obtained maximum values PZ_{max} ;

obtains a value LZ_{min} that is the smaller of the Z-axis direction components in the viewpoint coordinate system, of two (2) end points of an arbitrary line obtained from the plurality of polygons;

comparing the maximum value PZ_{max} of the Z-axis

10 direction component of the plurality of polygons with the value LZ_{min} that is the smaller of the above obtained Z-axis and order, and

at the time when $LZ_{min} \ge PZ_{max}$, executes a process for avoiding determination of whether or not the lines are hidden lines for polygons subsequent to the plurality of polygons sorted.

25. The information processing apparatus according to acc

the arbitrary line is a side common to polygons adjacent to each other, of which the angle formed by respective normal vectors is not equal or close to 0° .

25 26. The information processing apparatus according to claim 22, wherein the program executing and controlling means, according to the program, further;

defines an inclusive circle including vertices of the polygon when each of the plurality of polygons is projected onto a two-dimensional plane;

determines whether a portion of an arbitrary line is present in the inclusive circle corresponding to the polygon for the polygons for which determination of whether or not the line is an internal line is not avoided; and

two-dimensional plane when the portion of the arbitrary

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claim 24, wherein

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the arbitrary line is a side common to polygons adjacent to each other, of which the angle formed by respective normal vectors is not equal or close to 0° .

28. The information processing apparatus according to

defines an inclusive circle including vertices of the polygon when each of the plurality of polygons is projected onto a two-dimensional plane;

determines whether a portion of an arbitrary line is
25 present in the inclusive circle corresponding to the
polygon for the polygons for which determination of whether
or not the line is an internal line is not avoided; and

erases hidden line portions of a line on the two-dimensional plane when the portion of the arbitrary line is present in the inclusive circle.

5 29. An information processing apparatus for creating a two-dimensional image by projecting a three-dimensional model consisting of a plurality of polygons onto a two-dimensional plane, comprising:

a memory storing a program for processing of avoiding

reading out of the program stored in the memory: and

a display apparatus for outputting and displaying a

15 two-dimensional image created by the program executed and
controlled by the program executing and controlling means,
wherein

the program executing and controlling means, in order
to identify a ridge line or an contour line of the
20 three-dimensional model appearing when only the interior
of the three-dimensional model is displayed, as an internal
line in projecting the three-dimensional model consisting
of the plurality of polygons onto the two-dimensional plane,
according to the program and based on the program data
25 stored in the memory,

determines the value in the Z-axis direction of a normal vector belonging to each of two polygons having a ridge

line or an contour line of the three-dimensional model as a common side; and

determines the common side as an internal line if the value in the Z-axis direction of any of the normal vectors of the two polygons is zero (0) or less based on the determination of the direction of the normal vector.

30. The information processing apparatus according to claim 29, wherein the program executing and controlling

determines the relation of the positions of the two
polygons in the Z-axis direction in the case where the
senses of the values in the Z-axis direction of the normal
vectors belonging respectively to the two polygons differs
from each other based on the determination of the direction
of the normal vectors; and

determines the common side as an internal line when the normal vector of a polygon present on the viewpoint side is negative.

31. The information processing apparatus according to claim 30, wherein the program executing and controlling means further:

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determines the common side as an internal line when
the senses of the values in the Z-axis direction of the
normal vectors respectively belonging to each of the two
polygons are different from each other based on the

determination of the directions of the normal vectors, when a portion of a side of one of the two polygons is hidden by the other polygon and when the direction of the normal vector of the other polygon is negative.

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32. The information processing apparatus according to claim 22, wherein the program executing and controlling means further:

determines the value in the Z-axis direction of the standard of the standard of the standard of the standard of the two polygons having a factor of the two polygons having a factor of the three-dimensional ways to save the standard of the three-dimensional ways to save the standard of the three-dimensional ways to save the sa

determines the common side as an internal line when
the value in the Z-axis direction of any of the normal
vectors of the two polygons is zero (0) or less based on
the determination of the directions of the normal vectors;
and

excludes the line determined as an internal line from the target of the arbitrary lines.

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33. The information processing apparatus according to claim 24, wherein the program executing and controlling means further:

determines the value in the Z-axis direction of the
25 normal vector belonging to each of the two polygons having
a ridge line or an contour line of the three-dimensional
model as a common side;

determines the common side as an internal line when the value in the Z-axis direction of any of the normal vectors of the two polygons is zero (0) or less based on the determination of the directions of the normal vectors; and

excludes the line determined as an internal line from the target of the arbitrary lines.

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34. The information processing apparatus according to and the motion of 10 octain 32, wherein a classical temperature to the contract of the contrac

and the second second the mormal@vectors+of#the pluralitymof*polygons (see fig. 5). every a components in the larbitrary part; have components in the larger of opposite direction against the direction of the line of sight from the viewpoint in the viewpoint coordinate 15 system.

> 35. The information processing apparatus according to claim 32, wherein the program executing and controlling means, according to the program, further:

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determines the common side as an internal line when some some the senses of the values in the Z-axis direction of the normal vectors respectively belonging to each of the two polygons are different from each other based on the determination of the directions of the normal vectors, 25 when a vertex of a polygon of the two polygons is in the other polygon, when the value in the Z-axis direction of a vertex of a polygon is larger than the value in the Z-axis

direction of a vertex of the other polygon and when the direction of the normal vector of the polygon is negative.

36. The information processing apparatus according to 5 claim 32, wherein the program executing and controlling means further:

determines the common side as an internal line when
the senses of the values in the Z-axis direction of the
normal vectors respectively belonging to each of the two
10 polygons are different from each other based on the
determination of the directions of the normal vectors,
when a portion of a side of one of the two polygons is
hidden by the other polygon and when the direction of the
normal vector of the other polygon is negative.

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- 37. An information processing apparatus for creating a two-dimensional image by projecting a three-dimensional model consisting of a plurality of polygons onto a two-dimensional plane, comprising:
- projecting of lines hidden by the polygons, and program data;

program executing and controlling means for executing reading out of the program stored in the memory: and

a display apparatus for outputting and displaying a two-dimensional image created by the program executed and controlled by the program executing and controlling means,

wherein

the program executing and controlling means,
according to the program and based on the program data,
determines the value in the Z-axis direction of the normal
vector belonging to each of two polygons having a ridge
line or an contour line of a three-dimensional model as
a common side;

determines the common side as an internal line when the common side as an inte

is arranged to display the sectional view of the three-dimensional model such that the sectional view is displayed in a state that it is stuffed, by excluding the line determined as an internal line from the target to be displayed in a line image projected on the two-dimensional plane.

claim 37, wherein

an internal line to be excluded from the target of display in a line image projected onto the two-dimensional plane is the common side determined as an internal line when the senses of the values in the Z-axis direction of the normal vectors respectively belonging to each of the two polygons are different from each other based on the

determination of the directions of the normal vectors, when a vertex of a polygon of the two polygons is in the other polygon, when the value in the Z-axis direction of a vertex of a polygon is larger than the value in the Z-axis direction of a vertex of the other polygon and when the direction of the normal vector of the polygon is negative.

state where a 39. The information processing apparatus according to the state of claim 38, wherein

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an-internal line to be excluded from the target of the way in $ilde{f r}$ which is a f r display in a line image projected onto the two-dimensional f r is f r . with the plane is the common side determined as an internal line of the common side determined as an internal line of the common side determined as an internal line of the common side determined as an internal line of the common side determined as an internal line of the common side determined as an internal line of the common side determined as an internal line of the common side determined as an internal line of the common side determined as an internal line of the common side determined as an internal line of the common side determined as an internal line of the common side determined as an internal line of the common side determined as an internal line of the common side determined as an internal line of the common side determined as an internal line of the common side determined as a side de when the senses of the values in the Z-axis direction of the normal vectors respectively belonging to each of the 15 two polygons are different from each other based on the determination of the directions of the normal vectors, when a portion of a side of one of the two polygons is hidden by the other polygon and when the direction of the normal vector of the other polygon is negative.

> 40. A program executed and controlled in an information processing apparatus for creating a two-dimensional image by projecting a three-dimensional model consisting of a plurality of polygons onto a two-dimensional plane, the 25 program being operable to execute a process for avoiding projecting of lines hidden by the polygons, the program comprising the steps of causing program executing and

controlling means to, based on program data stored in a memory:

obtain the maximum value PZ_{max} of the Z-axis direction component of each vertex in a viewpoint coordinate system 5 for each of the plurality of polygons belonging to parts constituting the three-dimensional model;

sort the plurality of polygons in a descending order to based on the obtained maximum values PZ max; which is not the contraction

obtain a value LZ_{min} that is the smaller of the Z-axis mark with 10 direction components in the viewpoint coordinate system for the way a newwork has of two c(2) endspoints of an warbitrary line obtained from the asserts as eliminated a nather pluralisty of spolygons; has the start that it has a market somewhat in

compare the maximum value PZ_{max} of the Z-axis direction component of the plurality of polygons with the value $\mathtt{LZ}_{\mathtt{min}}$ 15 that is the smaller of the above obtained Z-axis direction components of the arbitrary line, in the sorted order; and

·• .

at the time when $LZ_{min} \ge PZ_{max}$, execute a process for avoiding determination of whether or not the lines are the same 20 thidden lines for polygons subsequent to the plurality of the same same. polygons sorted.

41. The program according to claim 40, wherein, for the plurality of polygons belonging to the arbitrary part, 25 each of their normal vectors has a component in the opposite direction against the direction of the line of sight from the viewpoint of the viewpoint coordinate system.

- 42. A program executed and controlled in an information processing apparatus for creating a two-dimensional image by projecting a three-dimensional model consisting of a plurality of polygons onto a two-dimensional plane, the program being operable to execute a process for avoiding projecting of lines hidden by the polygons, the program comprising the steps of causing program executing and controlling means to, based on program data read out from
- the specified 10 . The memory: we the contribution of the street ~ 10 . We have the peak ~ 10 , the second ~ 10 , ~ 10

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- a three-dimensional model is projected onto a
 - 5 two-dimensional plane, and for a plurality of polygon groups constituting a part to which a line undergoing determination to be a hidden line or not; and

in the order of the priority polygon group and the plurality of polygon groups constituting the part,

component of each vertex in a viewpoint coordinate system

for each of the polygons;

sort the plurality of polygons in a descending order based on the obtained maximum values PZ_{max} ;

obtain a value LZ_{min} that is the smaller of the Z-axis direction components in the viewpoint coordinate system, of two (2) end points of an arbitrary line obtained from

the plurality of polygons;

n a parametris internacionale in la completa de la completa de la portinidada de la capación de la completa de

compare the maximum value PZ_{max} of the Z-axis direction component of the plurality of polygons with the value LZ_{min} that is the smaller of the above obtained Z-axis direction components of the arbitrary line, in the sorted order, and

at the time when $LZ_{min} \ge PZ_{max}$, execute a process for avoiding determination of whether or not the lines are hidden lines for polygons subsequent to the plurality of polygons sorted.

was set sizes z=4.3% . The spirogram vaccordings to sclaim z^40 , wherein is a set z^4 is the z

the arbitrary line is a side common to polygons adjacent to each other, of which the angle formed by respective normal vectors is not equal or close to 0 $^{\circ}$.

44. The program according to claim 42, wherein

the arbitrary line is a side common to polygons adjacent
to each other, of which the angle formed by respective of the second of

- 45. The program according to claim 40, wherein the program further causes the program executing and controlling apparatus to:
- define an inclusive circle including vertices of the polygon when each of the plurality of polygons is projected onto a two-dimensional plane;

determine whether a portion of an arbitrary line is present in the inclusive circle corresponding to the polygon for the polygons for which determination of whether or not the line is an internal line is not avoided; and erase hidden line portions of a line on the two-dimensional plane when the portion of the arbitrary line is present in the inclusive circle.

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46. The program according to claim 42, wherein the program is the program executing and controlling to the apparatus to:

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polygon when each of the plurality of polygons is projected onto a two-dimensional plane;

- determine whether a portion of an arbitrary line is present in the inclusive circle corresponding to the polygon for the polygons for which determination of whether or not the line is an internal line is not avoided; and erase hidden line portions of a line on the
- - 47. A program executed and controlled in an information processing apparatus for creating a two-dimensional image

 25 by projecting a three-dimensional model consisting of a plurality of polygons onto a two-dimensional plane, the program being operable to execute a process for avoiding

projecting of lines hidden by the polygons, the program comprising the steps of causing program executing and controlling means to, based on program data read our from a memory:

- in order to identify a ridge line or an contour line of the three-dimensional model appearing when only the interior of the three-dimensional model is displayed, as an internal line in projecting the three-dimensional model consisting of the plurality of polygons onto the two-dimensional plane,
 - determine the value in the Z-axis direction of a normal value of two polygons having a ridge value of the three-dimensional model as a common side; and
 - determine the common side as an internal line if the value in the Z-axis direction of any of the normal vectors of the two polygons is zero (0) or less based on the determination of the direction of the normal vector.

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further causes the program executing and controlling means
to:

determine the relation of the positions of the two polygons in the Z-axis direction in the case where the senses of the values in the Z-axis direction of the normal vectors belonging respectively to the two polygons differs from each other based on the determination of the direction

of the normal vectors; and

determine the common side as an internal line when the normal vector of a polygon present on the viewpoint side is negative.

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49. The program according to claim 48, wherein the program further causes the program executing and controlling means to:

determine the common side as an internal line when

10 the senses of the values in the Z-axis direction of the

normal vectors respectively belonging to each of the two

polygons are different from each other based on the

determination of the directions of the normal vectors,

when a portion of a side of one of the two polygons is

15 hidden by the other polygon and when the direction of the

normal vector of the other polygon is negative.

50. The program according to claim 40, wherein the program further causes the program executing and controlling means

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determine the value in the Z-axis direction of the normal vector belonging to each of the two polygons having a ridge line or an contour line of the three-dimensional model as a common side;

determine the common side as an internal line when the value in the Z-axis direction of any of the normal vectors of the two polygons is zero (0) or less based on

the determination of the directions of the normal vectors; and

exclude the line determined as an internal line from the target of the arbitrary lines.

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51. The program according to claim 42, wherein the program further causes the program executing and controlling means to:

determine the value in the Z-axis direction of the

determine the common side as an internal line when
the value in the Z-axis direction of any of the normal
vectors of the two polygons is zero (0) or less based on
the determination of the directions of the normal vectors;
and

exclude the line determined as an internal line from the target of the arbitrary lines.

20

52. The program according to claim 50, wherein the normal vectors of the plurality of polygons belonging to the arbitrary part have components in the opposite direction against the direction of the line of sight from the viewpoint in the viewpoint coordinate system.

- 53. The program according to claim 51, wherein the normal vectors of the plurality of polygons belonging to the arbitrary part have components in the opposite direction against the direction of the line of sight from the viewpoint in the viewpoint coordinate system.
- 54. The program according to claim 50, wherein the program further causes the program executing and controlling means to:
- the senses of the values in the Z-axis direction of the received normal vectors respectively belonging to each of the two polygons are different from each other based on the determination of the directions of the normal vectors,

 when a vertex of a polygon of the two polygons is in the other polygon, when the value in the Z-axis direction of a vertex of a polygon is larger than the value in the Z-axis direction of the direction of the other polygon and when the direction of the normal vector of the polygon is negative.

55. The program according to claim 51, wherein the program further causes the program executing and controlling means to:

20

determine the common side as an internal line when

25 the senses of the values in the Z-axis direction of the
normal vectors respectively belonging to each of the two
polygons are different from each other based on the

determination of the directions of the normal vectors, when a vertex of a polygon of the two polygons is in the other polygon, when the value in the Z-axis direction of a vertex of a polygon is larger than the value in the Z-axis direction of a vertex of the other polygon and when the direction of the normal vector of the polygon is negative.

further causes the program executing and controlling means

- Thus, we can be seen that the second of the second $oldsymbol{1}$
- the senses of the values in the Z-axis direction of the two normal vectors respectively belonging to each of the two polygons are different from each other based on the determination of the directions of the normal vectors, when a portion of a side of one of the two polygons is hidden by the other polygon and when the direction of the normal vector of the other polygon is negative.
 - 20 57. The program according to claim 51, wherein the program distribution is further causes the program executing and controlling means to:

determine the common side as an internal line when the senses of the values in the Z-axis direction of the normal vectors respectively belonging to each of the two polygons are different from each other based on the determination of the directions of the normal vectors,

when a portion of a side of one of the two polygons is hidden by the other polygon and when the direction of the normal vector of the other polygon is negative.

5 58. A program executed and controlled in an information processing apparatus for creating a two-dimensional image by projecting a three-dimensional model consisting of a plurality of polygons onto a two-dimensional plane, and for executing a process for avoiding projecting of lines 10 hidden by the polygons, comprising the steps of causing program executing and controlling means to, based one of the program data readout from a memory:

determine the value in the Z-axis direction of the normal vector belonging to each of two polygons having a ridge line or an contour line of a three-dimensional model as a common side:

determine the common side as an internal line when
the value in the Z-axis direction of any of the normal
vectors of the two polygons is zero (0) or less based on

20 the determination of the directions of the normal vectors;

display the sectional view of the three-dimensional model such that the sectional view is displayed in a state that it is stuffed, by excluding the line determined as an internal line from the target to be displayed in a line image projected on the two-dimensional plane.

59. The program according to claim 58, wherein

an internal line to be excluded from the target of display in a line image projected onto the two-dimensional plane is the common side determined as an internal line

5 when the senses of the values in the Z-axis direction of the normal vectors respectively belonging to each of the two polygons are different from each other based on the determination of the directions of the normal vectors, when a vertex of a polygon of the two polygons is in the other polygon, when the value in the Z-axis direction of a vertex of a polygon is larger than the value in the Z-axis direction of the direction of the other polygon and when the direction of the normal vector of the polygon is negative.

15 60. The program according to claim 59, wherein

display in a line image projected onto the two-dimensional plane is the common side determined as an internal line when the senses of the values in the Z-axis direction of the normal vectors respectively belonging to each of the two polygons are different from each other based on the determination of the directions of the normal vectors, when a portion of a side of one of the two polygons is hidden by the other polygon and when the direction of the normal vector of the other polygon is negative.

an internal line to be excluded from the target of